APPENDIX

Acute radiation effects in victims of the Chernobyl nuclear power plant accident

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Introduction

1. This Appendix sets out the essential findings of the clinical observation of a group of patients suffering from acute radiation sickness following the accident at the Chernobyl nuclear power plant on 26 April 1986. The observations were conducted at the specialized treatment centre in Moscow over a period of two years.

2. An initial report on the accident was submitted by the Soviet representatives to the Post-Accident Review Meeting held at the International Atomic Energy Agency in August 1986 and was summarized in IAEA Safety Series Technical Report No. 75 [I18] and in [G33]. The proposal to present this information in its present form was endorsed at the thirty-sixth session of UNSCEAR in March 1987.

3. The basic information on the radionuclide releases and the types of exposures of the irradiated persons coincided with the expected pattern for an accident at a nuclear power plant of similar type: as much as 100% of gaseous fraction of the noble gases and nuclides may have escaped from the plant; caesium, iodine and tellurium isotopes accounted for up to 10-20% of the nuclide inventory, and other radionuclides for up to 30% [I18].

4. The plant personnel and auxiliary staff present at the industrial site in the immediate vicinity of the accident zone were subjected to the combined effect of radiation from several sources: (a) short-term external gamma/beta radiation from the gas emission cloud (in the case of persons in the immediate area of the accident zone at the time of the explosion); (b) external gamma/beta radiation of decreasing intensity, from fragments of the damaged reactor core scattered over the industrial site; (c) inhalation of gases and aerosol dust particles containing a mixture of radionuclides; and (d) deposition of these particles on the skin and mucous membranes at the time of the intensive generation of steam or dust and the wetting of clothing (as a result of them being blown or washed off contaminated objects).

5. However, the most significant factor was the general, external and relatively uniform whole-body gamma-irradiation and the beta-irradiation of extensive body surfaces, coupled (except in two cases) with a very small intake of nuclides through inhalation, predominantly of radioiodine and caesium isotopes. Thus, the basic clinical picture was that of a distinctive acute radiation sickness caused by gamma-irradiation of the whole body and by beta-irradiation of extensive areas of the skin surface.

6. Direct and indirect dosimetry methods were used to determine the nuclide content in the body. A great many tests were carried out, both while the victims were alive and (in 28 cases) after they had died, so that it was possible to estimate the nuclide content in the body and the resultant dose levels. An example of these types of analyses is shown in Figure A.I., giving the distribution of various radionuclides in the lungs.

7. The iodine isotope content in the thyroid gland was determined repeatedly (as many as four to six